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Inertial deposition of aerosol particles in a periodic row of porous cylinders

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Abstract

© 2015 American Association for Aerosol Research. The aerosol flow through a periodic row of parallel porous cylinders is investigated. The air flow field outside the cylinders is described by the Navier-Stokes equations of viscous incompressible fluid. The extended Darcy-Brinkman equations are used to calculate the flow velocity inside a porous cylinder. The dependence of the efficiency of the deposition of aerosol particles by inertial impaction and interception on the Stokes number for various values of the Darcy number is studied. Comparison of the results obtained from the numerical model and an approximate analytical model is given. The combined approximate formula for the deposition efficiency of a cylindrical fiber in a parallel array proposed by Müller et al. (2014) is extended for the porous cylindrical fiber. The aerosol flow through the porous body composed by a random array of cylinders is calculated to estimate the interior deposition.

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